NASA SBIR/STTR Technologies

A1.03-9346 - A New Cryocooler for MgB2 Superconducting Systems in Turboelectric Aircraft

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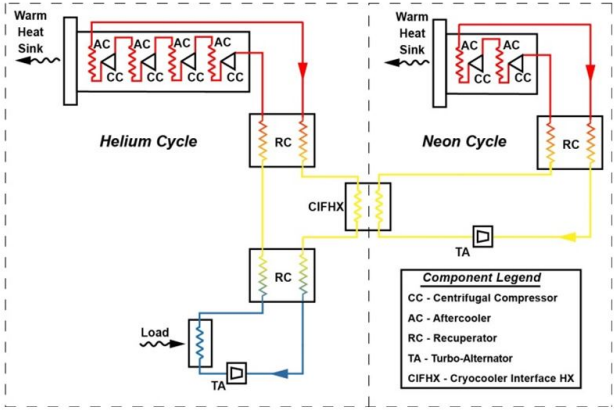
Identification and Significance of Innovation

Product: 15 K turbo-Brayton cryocooler.
Advantages: Lightweight and efficient.
Application: Cryogenic cooling for MgB2 superconducting systems.
Innovation: Combination of neon and helium cycles increases efficiency and reduces weight.
Impact: MgB2 materials are less expensive and have the potential for lower AC losses than competing HTS materials, but have a lower critical temperature and require a lightweight and efficient 15 K cryocooler.
Significance: Creare's cryocooler will be an enabling technology for turboelectric aircraft with MgB2 superconducting systems, which have the potential for large reductions in aircraft fuel burn, emissions, and noise.



Neon and Helium Cycles Are Combined Through a Cryocooler Interface Heat Exchanger (CIFHX) to Create a Lightweight, Efficient Cryocooler

Estimated TRL at beginning and end of contract: (Begin: 2 End: 3)

Technical Objectives and Work Plan

Objective:
Develop an extremely lightweight, high-performance turbo Brayton cryocooler optimized for cooling MgB2 superconducting devices in a turboelectric aircraft.

Work Plan:
Phase 1: Model different cycle configurations, select best cycle, preliminary component design, integrated system design, identify lowest TRL component.
Phase II: Develop and demonstrate lowest TRL component to bring system TRL to 4.
Phase III: Build and test complete cryocooler.

NASA Applications

Cooling for turboelectric aircraft technology demonstrations with MgB2 superconducting systems.
Cooling for cryogenic liquefaction and storage for space missions and at spaceports on earth.

Non-NASA Applications

Cooling for production turboelectric aircraft with MgB2 superconducting systems.
Cooling for MgB2 superconducting wind turbine generators.

Firm Contacts

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